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Geology of
Melba and Bisley Townships
District of Timiskaming

By

L. S. Jensen

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(back pocket)

Map 2252 (coloured)—Melba and Bisley Townships, District of Timiskaming.
Scale, 1 inch to ½ mile.

ABSTRACT

This report describes the geology and mineral occurrences of Melba and Bisley Townships, a 72 square mile area 10 miles north of Kirkland Lake in the District of Timiskaming, Ontario.

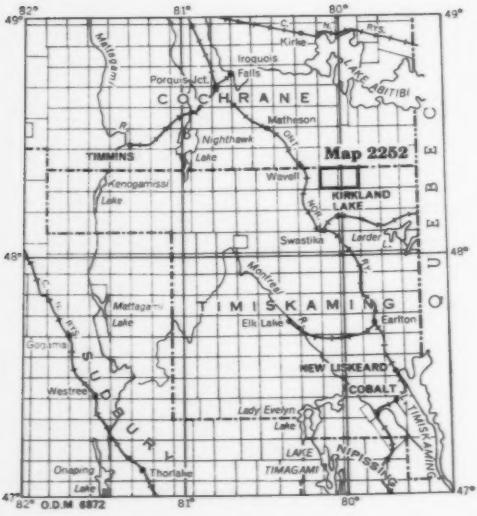

Figure 1—Key map showing location of Melba and Bisley Townships, District of Timiskaming. Scale, 1 inch to 50 miles.

In the area, volcanic, sedimentary, and intrusive rocks are part of an Archean volcanic belt that extends from Noranda west to Timmins. The layered assemblage consists of mafic, intermediate, and felsic volcanic flows and pyroclastic units with greywacke, chert, and argillite in the upper part of the sequence. The intrusive assemblage consists of stocks and sills of gabbro and dikes of hornblende diorite, monzonitic feldspar porphyry, and quartz diabase. The rocks have been affected only by autogenic hydrous deuteric alteration.

Structurally, the area is in the central part of an east-plunging synclinorium in which there are doubly plunging southeast-trending folds. Faults that strike west, northwest, northeast, and north, transect the area.

Gold and chalcopyrite mineralization is in quartz-calcite veins that cut the volcanic and sedimentary rocks and massive pyrite is in a volcanic flow breccia at the contact between felsic and intermediate volcanic rocks.

Geology
of
Melba and Bisley Townships
District of Timiskaming

by

L. S. Jensen[1]

INTRODUCTION

LOCATION AND ACCESS

Melba and Bisley Townships are located 9 miles north of the town of Kirkland Lake in the District of Timiskaming, Ontario (Figure 1). The townships are accessible by four gravel surface roads. Two roads lead from Highway 11 through Benoit Township to the west boundary of Melba Township and another road known as the Good Fish Road, extends north from Kirkland Lake to the central part of Melba Township. A turnoff from the Esker Lakes Park road extends into the southeastern part of Bisley Township. Additional access is possible by canoe along the Black River in early summer and by float-equipped aircraft to Kellett and Lauramay Lakes from the airbase at Kenogami Lake.

PREVIOUS INVESTIGATIONS

Melba and Bisley Townships were mapped in 1920 by D. G. H. Wright (1921) as part of a reconnaissance of the Black River area for the Ontario Department of Mines. Since then the only publications directly involving the area have been Aeromagnetic Maps 295G and 46G (GSC 1951; 1956) published by the Geological Survey of Canada.

Between 1911 and World War II, work was done by individual prospectors from Kirkland Lake searching for gold. Since then the emphasis has been shifted to the search for base metal deposits. Assessment work for two properties in Melba Township has been submitted to the Ontario Department of Mines (Table 1).

Thomson (1946; 1948; Thomson *et al.* 1948) mapped the gold-producing zones in the Kirkland Lake area to the south. Townships adjoining Melba and Bisley were mapped as follows: Arnold and Katrine Townships by Hogg (1963a; b)

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[1]Graduate student, University of Saskatchewan, Saskatoon. Manuscript accepted for publication by the Chief Geologist, Geological Branch, October 30, 1970.

Table 1 ASSESSMENT WORK IN MELBA TOWNSHIP ON FILE WITH ONTARIO DEPARTMENT OF MINES AND NORTHERN AFFAIRS

Element	Year	Kind of Information	Property of Claim Holder
Au	1965	Geological reports, assays, diamond drill logs, maps.	Pitchvein Mines Ltd. (3)
Cu	1966	Geological report, geophysical report and diamond drill logs.	C. Boland and D. Bell (1,2)

Benoit and Maisonville Townships by Lovell (1966; 1967) and Bernhardt and Morrisette Townships by Rupert and Lovell (1968a; b). Studies on the volcanic rocks of the Kirkland Lake area were conducted by Goodwin (1965; 1967), Barager and Goodwin (1969), and Ridler (1970).

PURPOSE AND METHODS

This report is a study of the geology of Melba and Bisley Townships. The purposes of the survey are to determine the nature of the bedrock and to describe any occurrence of ore-forming minerals which might lead to further economic development.

Field work was done in the summer of 1968 for the Ontario Department of Mines. Forest Resources Inventory maps of the Ontario Department of Lands and Forest were used as base maps. Field mapping was carried out on a scale of 1 inch to ¼ mile. Geological information obtained from pace-and-compass traverses was plotted on air photographs and transferred to the base maps. Traverses were made directly to all outcrops observed on air photographs and at intervals of ¼ mile in the other areas.

During the field season 824 hand specimens of bedrock were collected. From them, 200 thin sections and 647 x-ray fluorescence analyses were made at the University of Saskatchewan and by the Saskatchewan Research Council as part of the author's research project for a Master's degree.

ACKNOWLEDGMENTS

Assistance in the field was given by R. Sachrajuk, M. Achtman, and J. Woods. D. Rota, the senior assistant, was responsible for part of the geological mapping. The assistance and advice of H. Lovell, Resident Geologist, Ontario Department of Mines and Northern Affairs, Kirkland Lake, Ontario, during the field work was appreciated.

Dr. J. R. Smith of the Geology Division, Saskatchewan Research Council, provided the use of the Saskatchewan Research Council's facilities. He has con-

tributed much to the author's research through many interesting discussions relating to the chemistry of the bedrock.

Special thanks is extended to Dr. F. F. Langford of the Department of Geological Sciences, University of Saskatchewan, who acted as advisor during the author's research. His assistance with and criticism of this report were valuable.

TOPOGRAPHY

Melba and Bisley Townships are covered by lake sediments and esker deposits of glacial origin, through which bedrock is exposed. There is extensive outcrop in the western half of Bisley and in most of Melba Townships. The outcrops form north- to northwest-trending ridges separated by swamps or beaver meadows and give the area relief of 50 to 200 feet.

In the eastern part of Bisley Township, outcrop is sparse due to the thick layer of sand along the west flank of the Munro Esker which extends outside the area. There is a large area of swamp along the west side of the Munro Esker.

The area drains to the northwest via the Black River whose headwaters begin on the west side of the Munro Esker.

Vegetation consists mostly of jack pine, spruce, poplar, birch, and cedar. Recent logging operations have been concentrated on spruce and poplar. Some remain to be cut in the northwestern part of Bisley Township.

Eskers and outwash areas resulting from Pleistocene glaciation serve as potential sources of sand and gravel in the northwestern and central parts of Melba Township, and in the eastern part of Bisley Township.

Part of the Little Clay Belt which extends into western Melba Township along the Black River may allow for future agriculture.

No residences are maintained in the map-area.

GENERAL GEOLOGY

Melba and Bisley Townships are underlain by the Archean volcanic rocks extending from the Noranda area in Quebec to west of Timmins in Ontario. Stocks, sills, plugs, and dikes of mafic and felsic intrusive rocks cut the volcanic rocks. A few north-trending diabase dikes intruded all the rocks.

Pleistocene deposits consist of sand, gravel, and clay deposited on the Precambrian rocks during the retreat of the Wisconsinan glacier. Recent deposits consist of alluvium and peat.

The geological succession is summarized in the Table of Lithologic Units (Table 2). The layered Archean assemblage is a volcanic sequence with interbedded metasediments in its upper part. Intermediate volcanic rocks predominate in this sequence and the main units of mafic and felsic volcanic rocks are in the lower and upper parts respectively.

The bedrock of Melba and Bisley Townships has been affected by very low-grade regional metamorphism. Much of the alteration in the volcanic and intrusive rocks is ascribed to deuteric solutions during their emplacement. Minor recrystallization is in the volcanic rocks at the contacts of the intrusive bodies.

Table 2 | TABLE OF LITHOLOGIC UNITS MELBA AND BISLEY TOWNSHIPS

CENOZOIC

RECENT

Peat, alluvium

PLEISTOCENE

Gravel, sand, silt, varved clay

Unconformity

PRECAMBRIAN

ARCHEAN

LATE MAFIC INTRUSIVE ROCKS

Quartz diabase (dikes)

Intrusive Contact

FELSIC INTRUSIVE ROCKS

Hornblende diorite, monzonite porphyry

Intrusive Contact

EARLY MAFIC INTRUSIVE ROCKS

Gabbro, quartz gabbro, hornblende gabbro

Intrusive Contact

FELSIC VOLCANIC ROCKS

Pillow lava, flow breccia, pyroclastic rocks

INTERMEDIATE VOLCANIC AND SEDIMENTARY ROCKS

Massive lava, pillow lava, flow breccia, pyroclastic rocks, argillite

MAFIC VOLCANIC ROCKS

Basalt, andesite, massive lava, pillow lava, flow breccia

Structurally, the area is located in the central part of a synclinorium that opens to the east and in which southeast-trending, doubly plunging folds are found. Four recognized sets of faults transect the area. They strike west, northwest, northeast, and north. The west-striking faults are truncated by all other faults. Northeast and northwest faults which truncate each other are cut off by the north-striking faults. Shearing is found in places along the faults.

ARCHEAN

Definition of Terms

In this study, volcanic flows correspond to the map-units. A flow is defined as the effusion of one type of lava during the course of a single eruption (Macdonald 1967). Many of the flows consist of several parts representing separate "gushes" or sheets of magma that poured over one another during the course of a single eruption and are called flow-units (Nichols 1936). The structure of the lava which makes up the flow-units is used to name them.

Four types of flow-units of lava are recognized: massive, pillow, flow breccia, and contact flow breccia. Pillow lava flow-units consist of an agglomeration of rounded pillows which fit upon one another and the small intervening spaces are filled with materials of volcanic and sedimentary origin. The individual pillows have a fine-grained selvage and are amygdaloidal within. Flow breccias are flow-units in which fragments of lava produced by explosion or flowage have been welded together by the still liquid parts of the same lava. The shape of such fragments varies from angular to subrounded. Contact flow breccia is used to describe flow breccia at the base of a map-unit in which fragments of the underlying volcanic or sedimentary rock are incorporated. Massive flow-units are composed of homogeneous lava in which pillows and fragments are absent.

The pyroclastic rocks are classified as tuffs, lapilli tuffs, and agglomerates. The materials which make up these rocks are classified as dust, ash, lapilli, and bombs as indicated in Table 3.

Table 3 | PYROCLASTIC ROCK CLASSIFICATION MELBA AND BISLEY TOWNSHIPS

Volcanic Ejecta	Rocks
Bombs (larger than 64 mm)	Agglomerate
Lapilli (64 mm to 2 mm)	Lapilli tuff
Ash (2 mm to 1/256 mm)	Tuff
Dust (less than 1/256 mm)	

Tuffs are called vitric, crystal, and lithic tuff depending on the dominant type of ash.

The general rock classification is that used by Moorhouse (1959) and Williams *et al.* (1954).

Mafic Volcanic Rocks

OCCURRENCE

Mafic volcanic rocks which consist of basalt and basaltic andesite are in the lowest parts of the volcanic succession in Melba and Bisley Townships. A few also are in the succession interbedded with intermediate and felsic volcanic rocks. A total of eight separate mafic volcanic flows are recognized (see Geological Map 2252, back pocket). Their relative positions in the succession are defined by pillow flow top determinations.

In the southwestern part of Melba Township, the mafic volcanic flows are basalts. They are separated from one another by 1,000 feet of intermediate volcanic rock. Only a small part of the lower flow is in Melba Township. The upper mafic flow is from 2,000 to 4,000 feet thick, the variation being a depositional feature. At its base is a contact flow breccia 300 feet thick, 80 percent of which consists of fragments of the underlying volcanic rock. Above the contact flow breccia is a series of massive and pillow flow-units of basalt.

The black massive flow-units range from 10 to 200 feet thick and many of them have dark green selvages up to 2 inches thick along their upper and lower contacts. In the centre of these massive flow-units, the maximum grain size is 1 mm. Toward the upper and lower contacts the grain size decreases and amygdules 1 mm in diameter become abundant in the upper 6 inches. Massive flow-units compose about ⅓ of the total volume of the series.

The pillow flow-units are from 100 to 300 feet thick. Many of them grade downward and laterally into massive flow-units. The pillows are elliptical to circular in shape and are from 1 to 3 feet in diameter. Lenses of flow breccia 10 to 50 feet thick and up to 100 feet long are between some of the pillow flow-units.

In the northern part of Melba Township, a poorly exposed basalt flow extends northward into the next township. Only 2,500 feet of the total thickness is in Melba Township. Flow-units of massive and pillow lava similar to those in the southern part of Melba Township are present.

In the northern part of Bisley Township, there are two mafic flows of basaltic andesite separated by intermediate volcanic rocks.

The lower (northern) flow extends for 3½ miles and has a maximum thickness of 2,500 feet. Three contact flow-breccia lenses 10 to 15 feet thick and about 1,000 feet long are at its base. The upper (southern) flow has an exposed length of 4½ miles and maximum thickness of 2,000 feet. Both flows consist of massive, pillow, and flow breccia flow-units. Their relative proportions are about 30, 60, and 10 percent respectively and their range in thickness is from 10 to 100, 50 to 300, and 10 to 50 feet respectively. Amygdules as large as 5 mm are abundant in all the mafic volcanic flows.

Three additional mafic volcanic map-units are found in central Melba Township. They are all less than 800 feet thick and extend for distances of less than 1 mile. They are composed of pillow flow-units of basaltic andesite up to 200 feet thick. The pillows are ellipical in cross-section and are from 1 to 2 feet in diameter. Units of flow breccia up to 50 feet thick are in the pillow flow-units. They contain up to 80 percent subangular to subrounded fragments from ½ inch to 1 foot in size that are similar in colour to their matrix.

DESCRIPTION

The mafic volcanic rocks are divided into basalt and basaltic andesite. The two are distinguished by their colour, magnetic properties, mineralogy, and texture. The basalts are weakly magnetic, black aphanitic rocks with rusty weathered surfaces. Their composition is 50 to 60 percent augite, with minor pigeonite, 20 to 30 percent plagioclase (An_{50-55}), and 7 to 12 percent magnetite. Quartz, apatite, and pyrite are accessory minerals. The basalts are granular in texture with the grain size varying from 50μ to 1 mm.

The basaltic andesites are nonmagnetic rocks whose dark grey to dark green colour weathers to a light grey. Their mineral composition is 30 to 40 percent augite, 40 to 50 percent plagioclase (An_{45-50}) with accessory magnetite, pyrite, and apatite. Most basaltic andesites have phenocrysts of plagioclase 0.5 mm in length set in a pilotaxitic groundmass of feldspar and pyroxene microlites. Basaltic andesite with phenocrysts of plagioclase up to 1 inch in length occur as single flows in the basalt map-units of northern and southern Melba Township. They are massive flow-units whose dimensions could not be determined.

There is alteration of the mafic volcanic flows locally around intrusive bodies of gabbro. In the mafic volcanic rocks, chlorite, saussurite, and epidote alteration occurs as contact aureoles less than 100 feet wide around the intrusions. In the basaltic andesites, some flows have been altered by deuteric solutions to chlorite, saussurite, calcite, and uralite. Their poryhyritic textures are usually preserved.

Intermediate Volcanic Rocks

VOLCANIC ROCKS

Occurrence

Intermediate volcanic rocks underlie 70 percent of Melba and Bisley Townships. They consist of andesite and dacite and are found in all parts of the volcanic sequence. As previously indicated, in the basal part of the sequence near the southwestern corner of Melba Township, there is an andesite map-unit 1,000 feet thick between two mafic volcanic map-units. In the lower half of the volcanic sequence, above the mafic map-units in the northern and southern parts of Melba Township, the intermediate volcanic rocks are predominantly andesitic map-units which overlie one another. Two map-units of dacite and one map-unit of basaltic andesite are in the andesite map-units. The andesite map-units are from 200 to 1,500 feet thick and extend for distances of 1 to 3 miles and many extend into the adjoining townships. They consist chiefly of massive and pillow flows from 50 to 500 feet thick. Contact flow breccias up to 50 feet thick are at the base of some of the map-units.

The intermediate volcanic rocks of the upper part of the volcanic sequence in Bisley Township and central Melba Township are predominantly dacite flows and pyroclastic map-units with a few interlayered andesite map-units. The flows and

pyroclastic units are from 400 to 2,500 feet thick and extend for distances of 1 to 6 miles. Massive, pillow, and flow breccia flows from 50 to 500 feet thick comprise the lava map-units.

Tuffs, lapilli tuffs, and agglomerates make up the pyroclastic units of dacite. They are interbedded with the dacite flows. Tuffs and lapilli tuffs grade into one another and most of them are lenses 10 to 50 feet thick and 1,000 to 2,000 feet long. There is an extensive unit of dacite tuff about 100 feet thick and 2 miles long southeast of High Falls in the centre of Melba Township. A similar tuff unit 3 miles in length extends southeast along a synclinal axis from the Melba-Bisley township boundary to Lauramay Lake.

At High Falls, there is an agglomerate whose total extent is unknown. Outcrops of agglomerate also occur 4,000 feet north of High Falls. Dacite fragments up to 3 feet long compose 50 to 60 percent of the agglomerate.

Description

In general, the andesites are dark grey to dark green aphanitic rocks that have smooth, medium grey to light grey weathered surfaces. Some andesites are lighter in colour depending on the bleaching effect caused by the alteration of their primary minerals to carbonate, saussurite, and chlorite.

The andesite map-units consist of massive, pillow, and flow breccia flows. The massive flows make up about 30 percent of the andesite and are homogeneous units in which selvages and rock fragments are absent except in their upper and lower contacts. Many of the massive flows grade upward into pillow flows. The pillows are elliptical and are from 1 to 2 feet in diameter. Their tops have smooth curvatures and their bottoms are pointed downward perpendicular to the longest axes of the pillows. On the outcrop, the light pillows have dark green selvages from ½ to 1 inch thick which are soft and more deeply weathered. Spaces between the pillows contain subangular andesite fragments. Pillow lava composes about 65 percent of the andesite map-units.

Andesitic flow breccias contain andesite fragments of the same composition and colour as their matrix. The weathering around the edges of the fragments make their size, shape, orientation, and quantity readily observable. The flow breccias typically contain from 70 to 80 percent subangular to subrounded fragments which are from ½ inch to 12 inches in size. Many of the smaller fragments are oriented parallel to the surfaces of the larger fragments.

The mineral composition of the andesites is 60 to 70 percent plagioclase (An_{33-50}), 20 to 25 percent augite and accessory quartz, magnetite, and pyrite. They have a porphyritic texture containing phenocrysts of zoned plagioclase (An_{30-30}) up to 0.5 mm in length in a pilotaxitic groundmass.

The dacites are light grey to light green with light grey weathered surfaces. They are distinguished from light coloured andesites by their harder surfaces. Dacites contain massive, pillow, and flow breccia lava flows. The pillow flow-

units are from 100 to 500 feet thick and make up about 70 percent of the dacite. The long axes of the pillows are twice the length of their short axes giving them a bun-shaped appearance. They are from 2 to 6 feet in length. The pillow selvages weather to a dark brown or a dark green colour causing the light green to light grey pillows to show up on the outcrop surfaces. They are from ⅓ to ⅔ inch thick.

The dacite flow breccias are composed of 70 to 80 percent angular to subangular fragments from ½ inch to 18 inches in size. The flow breccias are up to 150 feet thick and extend up to 4 miles in length.

The fragments show up on the outcrop surface much the same way as those in the andesite flow breccias. Some are broken pillow fragments in which pillow selvages are preserved.

The mineral composition of the dacite is 70 to 80 percent plagioclase (An_{25-40}), 5 to 10 percent augite, and 5 to 15 percent quartz. Accessory minerals are pyrite and magnetite. The dacitic rocks have zoned phenocrysts of plagioclase (An_{30-40}) up to 0.5 mm in length which form clusters 1 to 2 mm in diameter and quartz phenocrysts up to 0.1 mm in size. The phenocrysts are in a quartzo-feldspathic, spherulitic or "felty" groundmass.

In both andesites and dacites, the plagioclase and augite are partly altered to chlorite, calcite, saussurite, albite, and quartz. Much of the alteration is the result of propylitization ascribed to deuteric solutions. The degree of alteration is a consistent feature of individual flows and varies from flow to flow.

Near intrusive contacts, the volcanic rocks are further altered. They are homogeneous green rocks cut by numerous irregular veinlets of epidote, calcite, and quartz. Epidote, chlorite, calcite, albite, and quartz replaced plagioclase and augite, thus destroying the original texture.

The intermediate pyroclastic rocks consist of tuff, lapilli tuff, and agglomerate. The tuffs are light grey granular rocks with rough rusty brown weathered surfaces on which small angular to round fragments of volcanic rock, crystal fragments, and spiculite forms are seen. A few tuffs have poorly developed graded bedding in which the beds are from 6 to 12 inches thick. The size of the fragments decreases upward from 2 mm to less than 0.5 mm. Most of the tuffs are massive.

In the tuffs, the fragments consist of chlorite pseudomorphs of shards, crystals of plagioclase (An_{20-25}), and volcanic fragments less than 2 mm in size. Volcanic dust and the minerals calcite, chlorite, zeolite, and pyrite fill the pore spaces between the fragments to compose the matrix. The tuffs consist of 20 to 40 percent matrix and 60 to 80 percent fragments.

Lapilli tuffs are light grey rocks in which dacitic fragments and oval grains from 1 mm to 4 mm are seen both on fresh and weathered surfaces. The dacitic fragments are subangular to subrounded and the oval grains are pisolites formed by the accretion of volcanic ash and dust. The fragments and pisolites are in a matrix of calcite, chlorite, and volcanic ash and dust. The matrix composes from 10 to 20 percent of the lapilli tuff.

Agglomerate consists of bomb-size dacite fragments in a tuffaceous matrix which forms up to 50 percent of the rock. Many of the light grey fragments are contorted and elongated and have green selvages ½ inch thick.

Intermediate Sedimentary Rocks

OCCURRENCE

Interbedded greywacke, chert, and argillite are in outcrops only at the Melba Gold Mine of Pitchveins Mines Limited (3) in west-central Melba Township. The exact extent of the sedimentary rocks is not known from the few outcrops seen in the area. Diamond drilling indicates that they are greater than 700 feet thick. (Moody 1962).

There are volcanic flows with fragments of chert and argillite in ten separate areas (see Geological Map 2252, back pocket). None are exposed for a distance greater than 500 feet and they seem to be less than 200 feet thick. They are chiefly within a 2-mile radius of High Falls. They also are in the northeastern part of Melba Township and the northwestern part of Bisley Township.

Volcanic greywacke occurs at five separate locations within a 2-mile radius of High Falls. All are small exposures less than 100 feet in diameter.

Based on pillows, the volcanic greywacke directly overlies the volcanic flows with sedimentary fragments. The contact is 4,000 feet southwest of High Falls. Recognized pillow volcanic map-units above and below the volcanic greywacke and the volcanic flow with sedimentary fragments indicate the two rock-types form distinct map-units within the volcanic sequence.

DESCRIPTION

The sedimentary rocks at the Melba Gold Mine are layered greywackes, argillites, and impure cherts. The layers are greenish grey to greenish black and are from 0.1 to 2 cm thick. Each layer consists of numerous laminae of similar grain-size material.

Argillite predominates in the sedimentary rocks. It consists chiefly of chlorite-rich laminae up to 1 mm thick and pyrite laminae up to 0.1 mm thick in which some of the quartz grains that are present are 10 μ or less. The greywacke has from 20 to 30 percent fragments of quartz and partly altered plagioclase grains up to 0.2 mm in size in a matrix consisting of chlorite laminae. The cherts consist chiefly of chert-rich laminae from 0.01 to 1 mm thick in which there are laminae of pyrite and chlorite.

Many of the larger laminae of greywacke and argillite have graded bedding and in some layers the laminae grade upward from greywacke to argillite or chert and from 2 mm to 0.1 mm in thickness, giving the layers a graded-bedding appearance. Cross laminae are in layers which are planar or concave, the angles of inclination being less than 20 degrees to the plane of stratification. The graded bedding and cross lamination are consistent with the top directions taken north of the Melba Gold Mine.

The sedimentary fragments which are in the volcanic flows are composed of argillite and argillitic chert. The fragments are black, subanglar to subrounded, ranging in size from 0.1 to 5 cm, and are readily seen in the light grey volcanic matrix. The larger fragments have laminae which are parallel to their long axes. The fragments show little or no chemical alteration. They are composed of amor-

phous chlorite, chert, and pyrite. In an outcrop, 3,500 feet north of High Falls, the sedimentary fragments are in a pilotaxitic dacite flow in which the plagioclase microlites and phenocrysts are parallel to the long axes of the fragments, probably indicating the fragments are parallel to the direction of flowage.

The volcanic rocks with sedimentary fragments are probably contact flow breccias caused by lavas flowing over poorly consolidated argillitic sediments. Sources for the fragments were not found.

Felsic Volcanic Rocks

OCCURRENCE

The felsic volcanic rocks compose about 5 percent of the total volcanic section in Melba and Bisley Townships. They are rhyodacites and almost all of them are in the upper half of the section interlayered with the dacites.

In Melba Township, ½ mile southwest of High Falls, a lens-shaped rhyodacite map-unit ranging from 100 to 1,200 feet in thickness extends for a distance of 3 miles. It is composed of flow breccia and massive flows from 50 to 200 feet thick. The flow breccias contain irregularly shaped pillows 3 to 4 feet in diameter. Many of the flow breccias grade downward into massive flows. A poorly bedded crystal tuff about 50 feet thick overlies the rhyodacite map-unit.

One irregular lens-shaped map-unit of partly altered rhyodacite is in the northeastern part of Melba Township. Its maximum thickness is 3,000 feet and it extends for an observed distance of 2 miles. Pillow flows predominate in the map-unit. The pillows are elliptical to irregular in shape and are 2 to 5 feet in diameter. They are light grey and have brown, strongly weathered selvages ½ to 1 inch thick. Fragments of rhyodacite up to 2 inches in size are common in their intervening spaces.

Based on flow top determinations, the rhyodacite map-unit is overlain by a unit of altered siliceous tuff less than 100 feet thick. It extends 4 miles east into Bisley Township where it grades into lapilli tuff and is 1,200 feet thick. In the southeastern quarter of Bisley Township, there are three flows of rhyodacite. The two largest map-units, which are about 2,500 feet thick and about 1 mile long, are on opposite limbs of an anticline and are considered to be equivalent. They consist of flow breccia flows in which angular fragments from .05 to 4 inches in size compose 50 to 60 percent of the rock. Light grey to white pillow structures, 3 to 6 feet across with light brown deeply weathered selvages from ¼ to ½ inch thick, are in the flow breccias.

The third map-unit is near the axis of the anticline. It is 600 feet thick and 2,000 feet long. It consists of flow breccias with interbedded tuff.

DESCRIPTION

The felsic volcanic rocks are light coloured aphanitic rhyodacites and quartz latites, many of which have a porphyritic texture. Plagioclase phenocrysts (An_{20-35}) 0.5 to 3 mm long and quartz phenocrysts 0.1 to 1 mm long compose up to 50 percent

of the porphyries. The phenocrysts are in a spherulitic quartz feldspathic matrix in which accessory magnetite, pyroxene, and pyrite occur as microclites. In altered felsic volcanic rocks, the matrix consists of fine-grained recrystallized quartz with interstitial sericite and chlorite.

The pyroclastic units are poorly bedded tuffs and lapilli tuffs in which fragments of plagioclase and quartz, siliceous rock, and pseudomorphs of glass shards are cemented in a matrix of calcite, chlorite, and quartz. In the altered tuffs, the plagioclase fragments are partly altered to saussurite and the pseudomorphs of glass shards are replaced by quartz, sericite, and chlorite causing much of the original texture to be destroyed.

Early Mafic Intrusive Rocks

OCCURRENCE

Early mafic intrusive rocks occur as sills, stocks, and dikes which intruded the volcanic sequence. The larger intrusions are predominantly gabbro and quartz gabbro. A sill of quartz gabbro 1,800 feet thick and 2 miles long extends southeastward into the next township from the southern part of Melba Township. A second lens-shaped sill is in the southwestern part of Melba Township along the axis of a syncline. Its true dimensions are not known because of faulting and folding in the area. Outcrops indicate the sill is 2½ miles long and 4,000 feet thick. The base as determined from pillow flow top determinations consists of gabbro 1,000 feet thick. The upper part of the sill is composed of quartz gabbro in which there are small bodies of hornblende gabbro. There is a third sill in north-central Bisley Township. Outcrops in the area indicate it has a maximum thickness of 4,500 feet. It is predominantly quartz gabbro with small bodies of hornblende gabbro.

There is a large stock or sill of quartz gabbro east and southeast of Lauramay Lake. It is truncated by three faults in the area. The outcrop extends 2½ miles northwestward from just north of the south boundary of Bisley Township.

A stock about 3,000 feet in long dimension, ½ mile north of Lauramay Lake, consists of gabbro and quartz gabbro.

Sixteen other stocks less than 1,000 feet in diameter and two dikes less than 250 feet wide and ½ mile long are in the area. They are predominantly hornblende gabbro and quartz gabbro.

DESCRIPTION

The early mafic intrusive rocks are dark to medium green massive gabbroic rocks whose grain sizes range from 1 to 5 mm. They are classified as gabbro, quartz gabbro, and hornblende gabbro; their mafic mineral content ranges from 40 to 70 percent.

The gabbros are dark green with 40 to 60 percent subhedral augite and 60 to 40 percent plagioclase (An_{50-60}). Interstitial quartz and magnetite are accessory primary minerals.

The quartz gabbros are medium green and have 30 to 40 percent subhedral augite, 50 to 60 percent subhedral plaglioclase, (An_{50-60}) and 5 to 10 percent anhedral interstitial quartz. Magnetite may be present as an accessory mineral.

In the gabbros and quartz gabbros, the augite and plagioclase are partly to completely altered. Chlorite and fibrous green uralite has replaced the augite and saussurite has replaced plagioclase. Where alteration is extensive, the original texture is partly to completely obliterated, and the rocks are a dull green.

Hornblende gabbros are dark green with the chief mafic minerals being brown and greenish brown hornblende. The general mineral composition is 35 to 40 percent hornblende, 30 to 40 percent plaglioclase (An_{35-50}), 0 to 10 percent quartz, 5 to 10 percent biotite, and 3 to 5 percent titaniferous magnetite. The hornblende occurs as anhedral poikilitic grains 3 to 5 mm across enclosing subhedral plagioclase. Quartz, subhedral magnetite, and biotite occur as interstitial grains. In many of the hornblende gabbros, the plagioclase is partly to completely saussuritized and hornblende and biotite are partly replaced by chlorite. In some small bodies of hornblende gabbro and in the quartz gabbro, the hornblende grains have small cores of augite.

Felsic Intrusive Rocks

OCCURRENCE

The felsic intrusive rocks are dikes of diorite and monzonite porphyry all of which are in the western half of Melba Township. Three poorly exposed diorite dikes strike east and each is less than 200 feet wide and 1,500 feet long. One dike is approximately 1 mile southwest of the Melba Gold Mine, the second at the Melba Gold Mine, and the third 2 miles northeast of the Melba Gold Mine.

Monzonite porphyry occurs only at the Melba Gold Mine and as irregular dikes less than 10 feet wide in both sedimentary rock and diorite.

DESCRIPTION

The diorite is a fine-grained dark reddish grey rock with grey weathered surfaces. Its composition is 30 to 35 percent hornblende, 55 to 60 percent plagioclase (An_{20-30}), and 2 to 3 percent quartz. Pyrite and apatite are accessory minerals. Both plagioclase and hornblende have oscillatory zoning. Hornblende occurs as euhedral laths up to 5 mm long with subhedral plagioclase and interstitial quartz.

The monzonite porphyry is light coloured with phenocrysts of andesine that are rimmed by sodic orthoclase and that are up to 3 mm long. The phenocrysts comprise 50 percent of the rock. The matrix consists of quartz and feldspathic materials which are altered to sericite. The feldspar phenocrysts are saussuritized and kaolinized. Pyrite is an accessory mineral in the rock.

Late Mafic Intrusive Rocks

OCCURRENCE

The late mafic intrusive rocks are north-trending diabase dikes in Melba Township, which cut all other rocks in the area. They are most numerous in the western half of Melba Township and are considered to be part of a swarm of diabase dikes which is in Benoit Township west of the map-area.

In Benoit Township, the diabase dikes are unconformably overlain by Huronian sedimentary rocks of the Cobalt Group and are considered to be Matachewan Diabase dikes (Lovell 1966).

DESCRIPTION

The diabase dikes are dark grey equigranular rocks which have rusty brown weathered surfaces. The dikes are from a few feet to 200 feet wide and can be followed for distances that vary from 1,000 feet to 4 miles. Typically they have three mutually perpendicular sets of joints, the major vertical set being normal to their strikes. The dikes appear to follow vertical north-trending joints and fractures in the country rock. No evidence of either stoping or replacement is seen along their well-exposed contacts. The grain size is from 0.5 mm to 5 mm.

Mineral composition of the diabase rocks is 45 to 55 percent plagioclase (An_{45-55}), 30 to 35 percent clinopyroxene, 5 to 10 percent hornblende, 3 to 5 percent quartz, and 5 to 7 percent magnetite. Biotite, pyrite, apatite, and micropegmatite are accessory minerals. The clinopyroxene consists of augite and pigeonite, which is interstitial to the plagioclase laths. In some diabase dikes, the clinopyroxene grains have rims of hornblende and, in others, the plagioclase and clinopyroxene are slightly to partly altered to saussurite and uralite.

STRUCTURAL GEOLOGY

GENERAL REMARKS

The structural geology of the map-area has been determined mainly from the attitudes and types of the lava flows and the bedding of the sedimentary rocks and from top determinations based on a study of the shapes of pillows in the flows. Additional information is derived from individual lava flows, pyroclastic units, and sedimentary rocks which can be used as marker horizons in the layered sequence. The locations of many faults are indicated by linear valleys and trenches on air photographs.

Many of the volcanic flows vary several hundred feet in thickness within distances of a few thousand feet along their strikes. Pillows, amygdules, and rock fragments are structurally undeformed indicating the variation in thickness of the flows is largely a depositional feature. Because of this, and the lack of good exposures at the noses of many folds, the locations of fold axial traces are only approximate.

Measurements of the dips of faults were not easily obtained because streams and alluvium-filled valleys have developed along the faults.

Because of the uncertainties regarding the dips of faults and the location of fold axial traces, the net slips of most faults could not be determined accurately.

FOLDING

Regional setting

Melba and Bisley Townships occupy the central part of a synclinorium which is north of Kirkland Lake. The outer part of the synclinorium consists chiefly of mafic volcanic rocks. These were mapped south of the map-area by Lovell (1971) and by Rupert and Lovell (1970). Aeromagnetic maps (GSC 1951; 1956) of the area indicate that the mafic volcanic rocks continue through the townships to the west and north of Melba and Bisley Townships. The upper parts of these mafic volcanic rocks are in the northwestern and southwestern parts of Melba Township.

The tops of pillows and the attitudes of lava flows indicate that the synclinorium widens and plunges eastward and that the highest stratigraphic levels are in central Melba and Bisley Townships. This is supported by the fact that the volcanic rocks become more felsic toward the centre of the map-area.

Local Folding

A large syncline plunges eastward from Benoit Township into Melba Township. Its axial trace represents the approximate centre of the synclinorium. In the centre of Melba Township, the syncline curves southeast from the main trend of the synclinorium and is a reverse S-fold which is thought to extend through Kellett Lake and eastward into Morrisette Township south of Bisley. The axial trace of the fold is partly obscured by numerous faults and a large intrusion of gabbro in the eastern half of Melba Township.

Two flanking, doubly plunging reverse S-folds (an anticline and a syncline) are east of the syncline mentioned above. They extend southeast from east-central Melba Township through Bisley Township into Morrisette Township. These two folds probably represent a widening of the synclinorium. The axial planes of all three folds are convex to the northeast, possibly reflecting the presence of a northeast-trending synclinal cross fold. This depression may be a synclinal cross fold.

There is a doubly plunging anticline in the southeastern part of Bisley Township. It is also a reverse S-fold whose axial trace is approximately parallel to the previously mentioned folds and reflects the presence of a synclinal cross fold (see Geological Map 2252, back pocket). The synclinal cross fold is about 2 miles long. Several faults cross the anticline and offset its axial trace. The folds vary from open to nearly isoclinal. Average dip of the strata is 68 to 80 degrees and the dips of the axial planes are nearly vertical. The style of folding is apparently concentric because axial-plane

cleavage is nonexistent and there is little or no thickening of the layered units at the noses of folds. Some bedding-plane faults occur southwest of Lauramay Lake at the crest of the anticline. Here, the fault planes dip 65 degrees northwest parallel to the dip of the pillows and have slickensides parallel to the hinge of the fold.

The volcanic rocks in the north-central part of Bisley Township contain a weakly developed schistosity which is parallel to the general strike and dip of the volcanic rocks. The large gabbroic intrusive cutting these rocks has no schistosity.

FAULTING

Faults in the area can be roughly divided into four groups according to strike: east-trending, northwest-trending, northeast-trending, and north-trending. The east-trending faults are local faults truncated by other faults. At Lauramay Lake, there is a vertical east-trending shear, part of which is exposed along the shore near the lake's outlet. The syncline is displaced 1,300 feet horizontally to the east on the south side of the fault. Along the east-trending fault in central Bisley Township the volcanic rocks appear to be displaced 700 feet east on the south side of the fault. An east-trending fault is indicated from diamond drilling south of the Melba Gold Mine shaft (Moody 1962).

The northwest-trending faults extend across both townships and, therefore, are believed to be part of a regional fault pattern. They are at regular distances about 1 to 2 miles apart and have strikes which vary from N45W to N65W. Most of them show up on air photographs as straight lineaments occupied by streams. Where exposed in the bedrock, they are shear zones less than 50 feet wide with minor chlorite mineralization. The foliation within these zones indicate the faults dip from 70 to 85 degrees northwest. Displacements of fold axial traces are small, probably indicating that most of the faults are nearly vertical faults along which the main movement was vertical.

The northeast-trending faults have strikes which vary from N40E to N60E. They offset the folds only slightly thus they are probably dip-slip faults which dip steeply to the southeast. The offset is minimal where crossed by the northwest-trending faults.

There are two vertical, north-trending faults in Melba Township about 1 mile apart (see Geol. Map 2252, back pocket). The westernmost and most prominent fault extends from the north boundary of Melba Township south into Bernhardt Township where it is believed by Rupert (Rupert and Lovell 1970) to be a wrench-fault with a left-hand movement of 2,000 feet. The net slip of this fault can be calculated from the displacement of the upper contact of the basalts in the north and south parts of Melba Township and the synclinal axial plane. This calculation indicates the net slip to be about 2,500 feet with a rake about 80 degrees to the south. The west side is downthrown.

The second north-trending fault apparently displaces the synclinal axial plane 1,000 feet on the left-hand side.

ECONOMIC GEOLOGY

INTRODUCTION

The map-area is a favourable area for base and precious metal exploration because it is located between two important structures, the Larder Lake Fault and the Destor-Porcupine Fault and is in a belt of volcanic rock contiguous with that of the Noranda area. Gold and copper mineralization associated with quartz-carbonate veins is found in the area. The gold is in quartz and carbonate veins that are associated with dikes of hornblende diorite and monzonite that cut sedimentary rock. The copper is in quartz-carbonate veins that are found in intermediate and felsic volcanic rocks. Pyrite in disseminated grains and locally developed massive streaks is in the intermediate and felsic volcanic flows and pyroclastic units of central and northeastern Melba Township. Some sand and gravel deposits have been utilized for local road construction.

PROSPECTING AND MINING ACTIVITY

Melba and Bisley Townships were not prospected until after the discovery of gold in 1906 in the Kirkland Lake area, 9 miles to the south. Recorded data concerning mineralization dates back to 1934, but several pits and shallow shafts found by the author are probably older. Most of this early activity was concentrated on quartz-calcite veins in the search for gold.

Gold was found in 1934, 1 mile east and 2 miles south of the northwestern corner of Melba Township. In 1936, Melba Gold Mines Limited (3), after extensive surface work and 4,371 feet of diamond drilling, sank a shaft 246 feet deep inclined 55 degrees northeast. At the 225-foot level, 900 feet of lateral work was done. In 1939, The Teck-Hughes Gold Mines Limited optioned the property and did some mapping and sampling. The mine was closed down with the advent of World War II, and the next work was done by Pitchvein Mines Limited in 1959. From 1959 to 1963, the company bulldozed part of the outcrop, dewatered the shaft, and had the outcrop and underground workings mapped and resampled. This was followed by surface and underground diamond drilling. Work was suspended in 1963.

In 1962, C. Boland discovered chalcopyrite mineralization in the northeastern part of Melba Township. Several pits were opened in 1964, and in 1965 Midrim Mining Company Limited optioned the property. Airborne electromagnetic and magnetic surveys and seven diamond drill holes totalling 2,932 feet were completed before the option was dropped.

In 1965, T. Taminan and T. Sullivan staked several claims in east-central Melba Township after discovering a massive sulphide occurrence. Numerous pits have been recently sunk on the sulphide zone.

BASE AND PRECIOUS METAL MINERALIZATION

Quartz-Calcite Fissure Veins

Much of the precious and base metal mineralization, not only in Melba and Bisley Townships, but in the surrounding townships, is in quartz-calcite veins. The quartz-calcite veins are found in the volcanic and sedimentary rocks and are more abundant in or near felsic intrusive rocks. The quartz-calcite veins in the volcanic rocks are mostly less than 2 inches wide and 50 feet long. Many are along small fractures and are devoid of mineralization.

At High Falls, on patented claim L8891, small specks of chalcopyrite and gold occur sporadically in a vertical quartz-calcite vein striking N20W. The vein is 500 feet long and 1 foot wide and is in pillowed and agglomeratic intermediate volcanic rock. Four shallow pits and three shafts greater than 15 feet deep have been sunk along the vein.

A quartz-calcite vein 2½ feet wide and with blebs of chalcopyrite as large as 2 inches wide. The vein contains fragments of volcanic rock 1 inch in size and is near 2 miles north and 3 miles east of the southwestern corner of Melba Township. The vein strikes N70W and dips 85 degrees south and can be traced less than 25 feet because of overburden. An adit about 6 feet square shows the vein to be 90 percent coarsely crystalline calcite, 5 percent quartz, 3 percent angular brecciated volcanic rock, and 2 percent chalcopyrite. On an outcrop less than 200 feet northwest of the adit, irregular veins of quartz less than 6 inches wide contain specks of chalcopyrite. These veins have been partly exposed by two pits less than 12 inches deep.

Two miles due north of the southwestern corner of Melba Township grains of chalcopyrite up to ¼ inch in size are in an east-striking vein of calcite and quartz 6 inches wide. The vein contains fragments of volcanic rock 1 inch in size and is near the contact between pillowed rock and agglomerate. There is one pit 2 feet square on the vein.

On the north shore of Lauramay Lake in an irregular vuggy quartz-calcite vein 2 inches wide, specks of chalcopyrite and pyrite were found.

PROPERTIES

C. Boland and D. Bell (1, 2)

Copper mineralization was discovered by C. Boland in 1962 about ¾ mile west and 1½ miles south of the northeastern corner of Melba Township. The mineralization was subsequently staked by C. Boland and D. Bell and several shallow pits were sunk.

According to the assessment work files of the Ontario Department of Mines and Northern Affairs, Kirkland Lake, Midrim Mining Company Limited optioned the property in 1965 and from March until May, 1965, put down seven diamond drill holes, totalling 2,932 feet, on the mineral occurrence. All holes dipped 45 degrees in a S30E direction. Copper mineralization was found in all the holes except one, and the best value obtained was .31 percent copper over a length of 22.5 feet in Hole No.

1 (assessment work files, ODMNA, Kirkland Lake).

In July, 1965, Midrim Mining Company Limited had the property, plus an area extending south into Barnet Township, surveyed by an airborne magnetometer ('Elliot' Flux Gate, Total Field) and an electromagnetic unit (320 c.p.s. with 60-foot coil separation) belonging to Canadian Aero Mineral Surveys Division of Litton Industries. No anomalies were found in or near the mineralization.

The property is underlain by a lens-like unit of felsic volcanic rock interlayered with intermediate and mafic pillowed volcanic rocks that strike east and dip 70 to 80 degrees south. Pits on the surface reveal the mineralization is in quartz-calcite veins which are from 1 inch to 2 feet wide. The veins follow a shear zone which strikes N75W and dips 45 degrees south. There are fragments of brecciated volcanic rock and grains of chalcopyrite up to ¼ inch in size. East of the property the veins widen and blend into a lens of cherty rhyodacite tuff.

Information from diamond drilling indicates the quartz-calcite veins extend into rhyodacite 200 feet below the surface. Feldspar porphyry with disseminated fine-grained pyrite and chalcopyrite was reported in two of the holes.

Pitchvein Mines Limited (3)

Melba Gold Mine [1963]

Gold was discovered in 1934 on the east end of a shallow ridge in the north-western part of Melba Township. In 1936, Melba Gold Mines Limited optioned 27 claims which included the location of the initial discovery and during the next three years carried on a program of trenching, diamond drilling, shaft sinking, and underground work. To facilitate the program a road was built from Benoit Township and a bridge constructed across the Black River. Twenty diamond drill holes totalling 4,371 feet were completed and a shaft 246 feet deep inclined 55 degrees northeast was sunk. At the 225-foot level (185 feet vertically) a total of 900 feet of lateral work was done. (above and following information on Melba Gold Mine mostly from the assessment work files of ODMNA, Kirkland Lake, Ontario and company files).

Prospecting and trenching opened up four gold-bearing quartz-calcite veins; the Rolling Vein, the Mike Vein, the Blue Vein, and the Contact Vein. Of the veins, the Blue Vein (Photo 1) is the most important and it is the one on which the underground work was done.

On surface the Blue Vein was traced for a length of 600 feet with the best gold showings on the east 180 feet. All 20 diamond drill holes intersected the Blue Vein with visible gold reported in 10 of the first 18 holes. Hole No. 18 intersected a second vein north of the Blue Vein that ran .293 oz. gold per ton over 22 inches. In underground work on the Blue Vein, 200 feet was reported to have .371 oz. gold per ton over 3 feet "by face, muck, back and mill tests". The face sampling was .385 oz. gold per ton across 40 inches for 169 feet. Underground work was also done on a second vein, the Breccia Vein.

In 1939, The Teck-Hughes Mines Limited channelled and took a 4-ton bulk sample over a length of 60 feet on the Blue Vein during a 60-day option. The channel sample gave .327 oz. gold per ton over 4.5 feet and the bulk sample gave .210 oz. gold per ton over 4.5 feet.

ODM8688

Photo 1—Blue Vein, Melba Gold Mine Property, Pitchvein Mines Limited (3), 300 feet west of shaft. Melba and Bisley Townships.

In 1959, Pitchvein Mines Limited bulldozed part of the outcrop, dewatered the shaft, and had the underground and outcrop mapped and the veins resampled. The Blue Vein returned .471 oz. gold per ton over 3.2 feet for 170 feet or .343 oz. gold per ton over 275 feet, uncut grade and the Breccia Vein returned .658 oz. gold per ton across 3.1 feet for 80 feet, uncut grade (Figure 2).

In 1960, Pitchvein Mines Limited dewatered the shaft again and drilled 25 underground holes totalling 1,771.4 feet. All holes intersected quartz veins and brecciation with mineralization. In 1962, three diamond drill holes totalling 1,704.7 feet were put down to investigate the Rolling Vein and the low ground southwest of the shaft. Hole No. 1 failed to hit bedrock and Holes No. 2 and No. 3 intersected low gold values over short lengths. No further work was done.

In 1967, when the author visited the property the bridge had been washed out and much of the road was in poor condition. The camp buildings, including the core shack, were still in fair condition.

Outcrop is limited to the area around the shaft where the gold mineralization was initially found. The outcrop is mostly sedimentary rock which has been already described. Volcanic rocks occur as a small wedge west of the shaft separated from the sedimentary rocks to the north by a fault with a strike N55W and from the sedimentary rock to the south by dikes of hornblende diorite. Information from deep diamond drilling south of the volcanic rocks indicate the sedimentary rocks dip 20 to 30 degrees south and 70 to 80 degrees south at depths of 300 feet. One drill hole south of the outcrop failed to reach bedrock at 230 feet (45 degree hole) indicating the outcrop is a ridge which drops off sharply to the south.

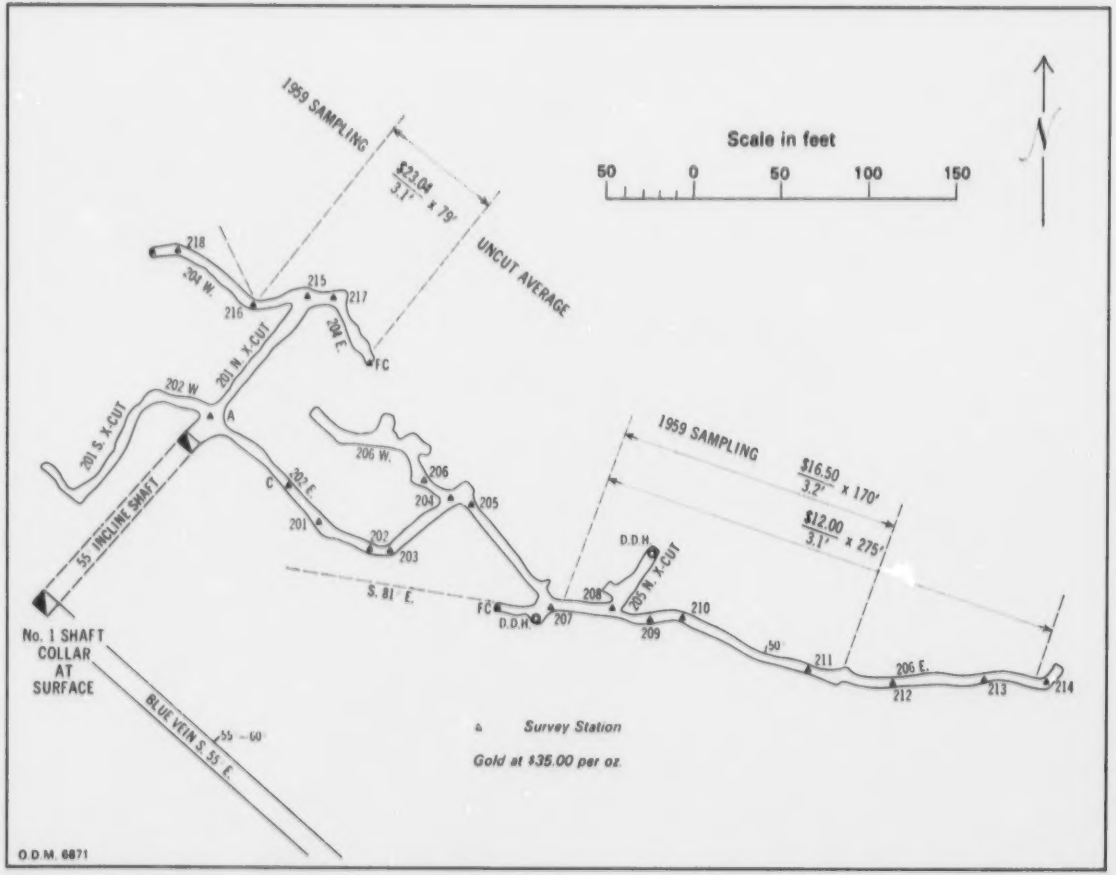


Figure 2—Pitchvein Mines Limited. Melba Township Property (3). Plan of 225-foot level.

ODM8689

Photo 2—Melba Gold Mine (3) shaft and buildings, 1968. Melba and Bisley Townships.

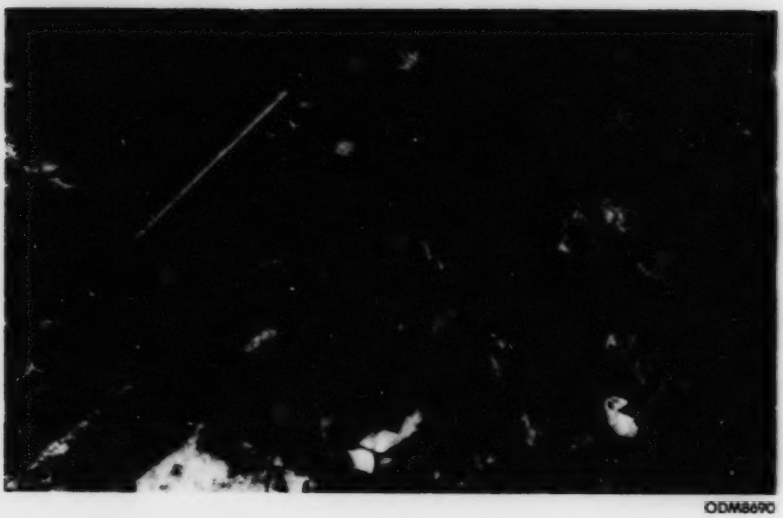
The Blue Vein, on which most of the work was done, strikes N55W and is associated with the faulting which cuts the sedimentary rocks and along which a monzonite dike was intruded. The vein dips 55 degrees northeast and can be traced for 600 feet on surface where it ranges from 3 inches to 2 feet in width. A fault striking N30E offsets the Blue Vein, the monzonite dike, the N55W fault, and the sedimentary rocks. The apparent offset of the vein is 60 feet to the north on the east side of the fault.

It was on the east side of the N30E fault in the sedimentary rocks that the shaft was sunk. Underground work indicates the monzonite is irregular and the best values of gold is where the vein and the N55W shear are along the contact of the sedimentary rocks and the monzonite.

The Rolling Vein and Contact Vein are quartz-carbonate veins parallel to and south of the Blue Vein and the Mike Vein is a crosscutting vein striking N30E. Of these four veins, the Blue Vein was the only one found in underground investigations. Other gold-bearing veins, notably the Breccia Vein, were found in underground investigations.

Disseminated and Massive Sulphides

Pyrite is found finely disseminated in all the volcanic and in many of the intrusive rocks. It is only in the intermediate and felsic pyroclastic rocks that pyrite is abundant. In the lapilli tuffs and tuffs, pyrite is disseminated and as accretions up to ¼ inch in diameter.



ODM8690

Photo 3—T. Taminan and T. Sullivan property (4). Close-up photograph of flow breccia, with pyrite matrix. Pencil points to pyrite. Melba and Bisley Townships.

PROPERTIES

T. Taminan and T. Sullivan (4)

About six pits, the largest being 4 feet square and 2 feet deep, have been sunk in an occurrence of massive and disseminated pyrite mineralization 2 miles south and ½ mile west of the northeastern corner of Melba Township. Surface work was begun in 1965 and continued until 1970.

The property is underlain by felsic agglomerate and lapilli tuff breccia and pillowed intermediate lavas that strike east. The felsic pyroclastic rocks are part of a unit which can be traced westward for 3 miles and are probably a fault-displaced part of the felsic pyroclastic rocks which extend from the Boland and Bell property eastward into Bisley Township.

Near the property, the pyroclastic rocks are strongly mineralized with pyrite over a distance of 2,000 feet. At the contact between the intermediate volcanic flows and the felsic pyroclastic rocks is a lens of flow breccia in which fragments of dacite are cemented by massive pyrite. The fragments range from ¼ inch to 1½ feet in diameter. The pyrite flow breccia lens is less than 50 feet thick and 200 feet long. In the main pit, pyrite composes 20 percent of the rock (Photo 3). A few grains of chalcopyrite up to ⅛ inch in size are found in the pyrite. No shearing or alteration was found in either the pit or the nearby outcrops.

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